The Structure of N_2 in Porous Vycor Glass*	X18A

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Recently a great deal of effort has been expended to study the effects of finite size and confinement on the properties of simple gases, liquids, and solid, achieved by adsorption into mesoporus materials. Examples of such mesoporous materials include sol-gel glasses, porous Vycor glass, zeiolites and of course rocks and cements. These porous media are of technological interest in fields such as rheology, tribology, and materials research. The adsorbed samples provide a platform for fundamental studies of surface effects as well as molecular interactions with surfaces which is unattainable in bulk samples.

While many measurements of macroscopic quantities such as the heat capacity of confined materials have been reported few microscopic measuremnts are available. To explore the effects of confinement on the structure of simple solids we have carried out x-ray diffraction measurements of molecular nitrogen condensed and solidified in porous Vycor glass.

The melting point of the confined N_2 marded by the disappearance of the diffraction peaks, was found to be 57 K in the bulk. Figure 1 shows the diffraction pattern of confined N_2 at 55 K without the scattering from the Vycor removed along with dashes marking the position of the bulk peaks in the b phase which is hexagonal close packed (hcp). The confined peaks are located approximately 1than are the bulk peaks. This is an effect we have reported previously concerning CO_2, Kr, and Ar in Vycor glass. The (102) peak is not evident in the scattering, but as it is reported as having a smaller structure factor than ever the (110) peak it is possible that it is below our ois level. Thus we believe the confined solid to have the same structure as the bulk with slightly large lattice parammeter. Further cooling to 20K failed to reveal the solid-solid phase transistion to a phase as seen in the bulk.

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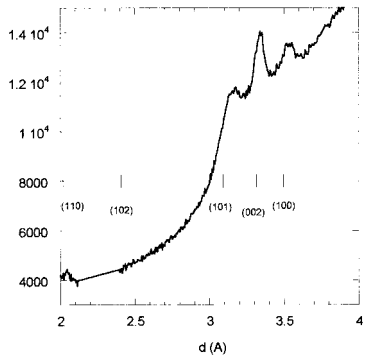

Figure 1. Diffraction pattern of N_2 confined in Porous Vycor Glass. The scattering from the cell has not been removed. Peak positions in the bulk a phase have been marked.